PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in or relating to Electric Motors

We, LEAR, INCORPORATED, of 3171, South Bundy Drive, Santa Monica, California, United States of America, a corporation organised and existing under the laws of the State of Illinois, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to electric motors incorporating brakes.

In electric motors it is desirable in some instances to have the motor output shaft stop rotating as soon as possible after the motor has been de-energised.

According to one aspect of the present invention there is provided an electric motor comprising a housing, pole pieces fixedly mounted within the housing, a rotor supported by the housing, magnetic braking members displaceably arranged within the pole pieces and resilient apparatus urging the braking members against the rotor, the braking members being arranged to be drawn away from the rotor against the force of the resilient apparatus by the flux build-up in the pole pieces when the motor is energised.

According to another aspect of the invention there is provided an electric motor comprising a rotor, stator windings and pole pieces, a plurality of plungers mounted in recesses in the pole pieces and resilient apparatus urging the plungers into braking engagement with the rotor, the plungers being of magnetic material such that when the stator windings are energised the flux build-up causes the plungers to be magnetically drawn away from the rotor.

The invention will be described further, by way of example, with reference to the accompanying drawing in which:—

Fig. 1 is a partial sectional view of a motor with parts broken away for clarity;

[*Price 4s. 6d.*]

Fig. 2 is a sectional detail of a motor incorporating a switch;

Fig. 3 is a sectional view of a motor incorporating a positive locking means for the brake; and

Fig. 4 is a sectional view of a motor provided with a brake band on the rotor.

In Fig. 1 a housing 10 has pole pieces 11 and 12 secured thereto. A rotor 17 has a shaft 18 journalled in the housing. The pole pieces 11 and 12 have respective stator windings 13 and 15; between which pole pieces the rotor 17 is free to rotate. Plungers 19 and 20 are located respectively in the magnetic pole pieces 11 and 12. Springs 21 and 22 urge the plungers 19 and 20 respectively toward the rotor 17. In Fig. 1 the plungers 19 and 20 are withdrawn from the rotor 17 allowing the rotor 17 to rotate with respect to the housing 10.

In operation, when the motor is de-energised, the springs 21 and 22 urge the plungers 19 and 20 respectively into braking engagement with the rotor 17. When the motor is energised, a magnetic flux path is built up in the pole pieces. It can be seen that when the plungers are against the rotor 17, the flux path passing through the pole pieces and plungers 19 and 20 would be actually distorted. The flux exerts a force in trying to find the path of least reluctance. Hence the plungers 19 and 20 are pulled away from the rotor 17 and retracted into the pole pieces. It is understood that the springs 21 and 22 are chosen to provide a force to the plungers that will stop the rotor 17 from rotating but which force is small enough to be overcome by the flux force in the pole pieces.

Fig. 2 shows a refinement of this embodiment wherein a shaft 23 extends from the plunger 19. A switch 24 is mechanically coupled for actuation by the plunger by being attached to and operated by the shaft 23. This switch may control an external motor

or circuit breakers in response to the braking and releasing of the rotor 17 by the plunger 19.

A brake lining 25 of asbestos or similar material may be positioned on that portion of plunger 19 which comes in contact with the rotor 17 to reduce wear on the rotor 17.

Fig. 3 shows a further improvement which provides a positive locking means for the rotor 17. In this case the plunger 19 is positioned in the pole piece 11 in the same manner as described in Figs. 1 and 2. However, an additional, second, plunger 26 is positioned in a hole in the plunger 19 and a second spring 27 urges the second plunger 26 against the rotor 17. In this embodiment, the rotor 17 has slots 28 to accommodate the second plunger 26. The spring 27 in this case is chosen to be weaker than the spring 21. Now it can be seen that as the flux builds up due to the energisation of the motor, the weaker spring 27 will be overcome first by the flux retracting the second plunger 26 before the spring 21 is overcome by the flux urging the plunger 19 against the housing. Hence the positive locking means is released first and then the sliding brake or plunger 19 is released permitting the rotor 17 to rotate. When the motor is de-energised and the flux starts to decrease the stronger spring 21 engages the plunger 19 against the rotor 17 slowing down the rotor 17 and then when the flux decreases further the weaker spring 27 will urge the second plunger 26 against the rotor 17 and into one of the sloths 28 thereby providing a positive lock for the rotor 17.

Fig. 4 shows another embodiment of the present invention wherein a brake band 29 is placed on the rotor 17 to further increase the life of the brake and consequently of the motor. The brake band 29 preferably is constructed of a non-magnetic material such as bronze or copper. As shown in Fig. 4, the plungers 19 and 20 are engaged with the brake band 29 by the springs 21 and 22 when the motor is de-energised.

WHAT WE CLAIM IS: —

1. An electric motor comprising a housing, pole pieces fixedly mounted within the housing, a rotor supported by the housing, magnetic braking members displaceably arranged within the pole pieces, and resilient apparatus urging the braking members against the rotor, the braking members being arranged to be drawn away from the rotor against the force of the resilient apparatus by the flux build-up in the pole pieces when the motor is energised.

2. An electric motor comprising a rotor, stator windings and pole pieces, a plurality of plungers mounted in recesses in the pole pieces, and resilient apparatus urging the plungers into braking engagement with the rotor, the plungers being of magnetic material such that when the stator windings are energised the flux build-up causes the plungers to be magnetically drawn away from the rotor.

3. An electric motor as claimed in Claim 2 wherein the plungers slide in their respective recesses and are wholly contained therein when the motor is energized.

4. An electric motor as claimed in Claim 2 or 3 including an electric switch mechanically coupled for actuation by one of the plungers.

5. An electric motor as claimed in Claim 2, 3 or 4 including a brake lining positioned on each plunger for contact with the rotor.

6. An electric motor as claimed in any one of Claims 1 to 3 or 5 wherein the rotor includes a brake band mounted on its periphery for engagement by the said braking members or plungers, respectively.

7. An electric motor as claimed in any one of Claims 2, 3 or 5 including an additional plunger contained within one of the first mentioned plungers and arranged to provide positive locking means for the rotor when the stator windings are de-energised.

8. An electric motor as claimed in Claim 7 wherein the said one of the first mentioned plungers is urged into braking engagement with the rotor by first spring means and the additional plunger is urged into locking engagement with the rotor by weaker spring means such that on the stator windings being energised the additional plunger is withdrawn from the rotor before the first mentioned plungers.

9. An electric motor as claimed in Claim 7 or 8 wherein the rotor is provided with peripheral slots to accommodate the additional plunger.

10. An electric motor constructed and arranged to operate substantially as described herein with reference to and as illustrated in Figs. 1, 2, 3 or 4 of the accompanying drawing.

POTTS & CO.

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920485 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

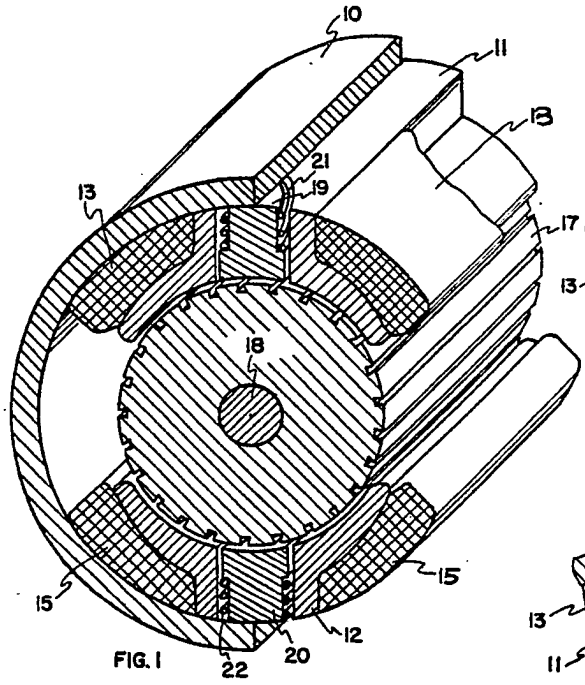

FIG. 1

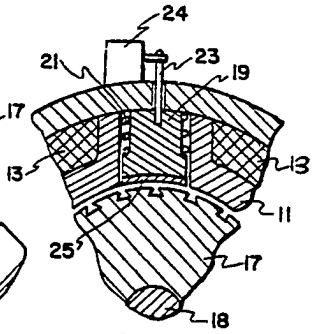

FIG. 2

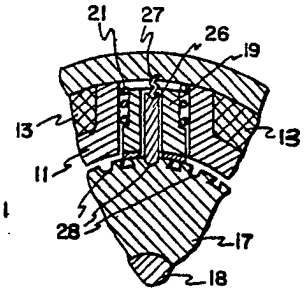

FIG. 3

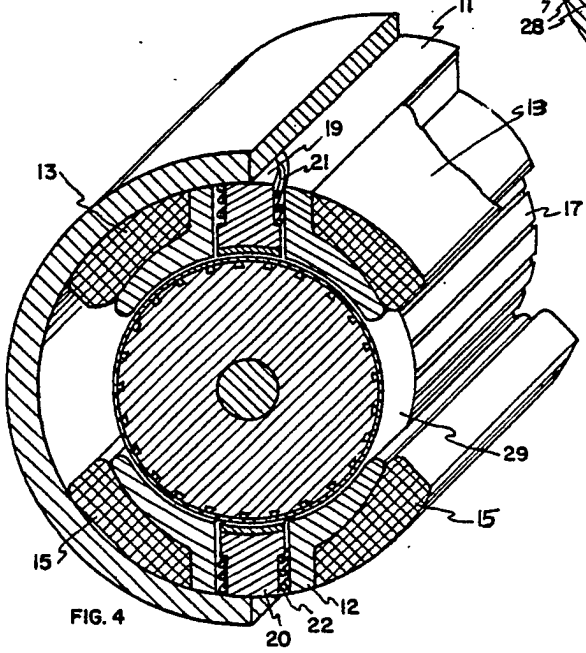

FIG. 4